SERC Talks: "How is T&E Transforming to Adequately Assess DOD Systems in Complex Operating Environments?"

December 1, 2021 | 1:00 PM ET

Dr. Sandra Hobson

Deputy Director for Strategic Initiatives, Policy and Emerging Technologies, Office of the Director, Operational Test and Evaluation, Office of the Secretary of Defense

TEST & EVALUATION

- ❑ Today's session will be recorded.
- ❑ An archive of today's talk will be available at: www.sercuarc.org/serc-talks/ as well as on the SERC YouTube channel.
- ❑ Use the Q&A box to queue questions, reserving the chat box for comments, and questions will be answered during the last 5-10 minutes of the session.
- ❑ If you are connected via the dial-in information only, please email questions or comments to SERCtalks@stevens.edu.
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SYSTEMS ENGINEERING RESEARCH CENTER

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SERC TALKS

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TEST & EVALUATION

Dr. Laura Freeman, SERC Research Council Member, Director of the Hume Center's Intelligent Systems Lab and Assistant Dean for Research in the College of Science, and Research Associate Professor in the Department of Statistics at Virginia Tech

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How is T&E Transforming to Adequately Assess DOD Systems in Complex Operational Environments

Sandra Hobson

Performing the Duties of Principal Deputy Director

Deputy Director, Strategic Initiatives, Policy and Emerging Technologies

01 December 2021

DOT&E mission is outlined in Title 10 USC

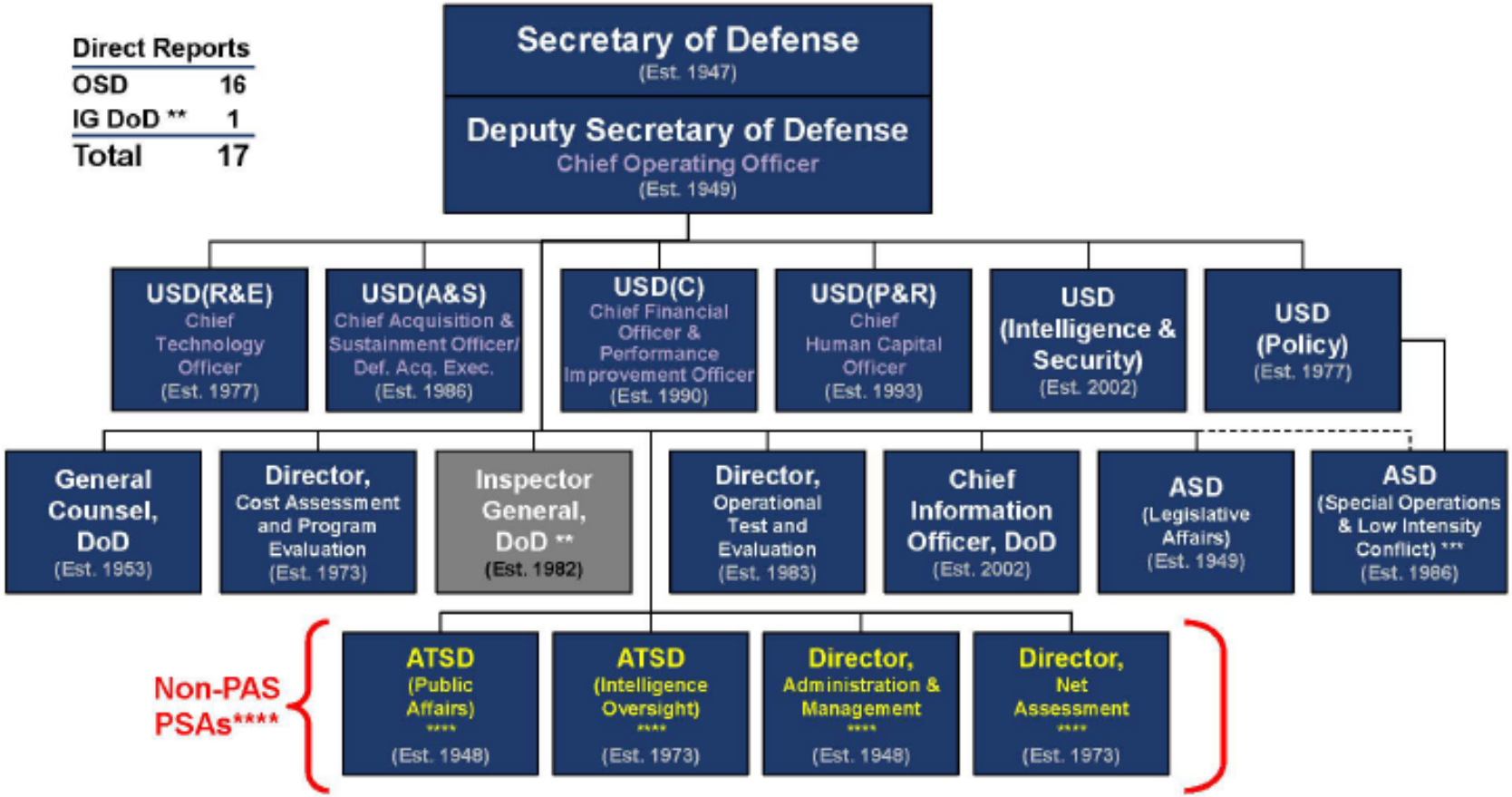
- **Oversight**
  - Independently assess the effectiveness/lethality, suitability and survivability of U.S. warfighting & business capabilities in operationally representative scenarios.
- **Report to Secretary of Defense and Congress on:**
  - Operational effectiveness, suitability, survivability and lethality of Department of Defense acquisition programs.
  - Adequacy of Services' operational and live fire T&E plans.
  - Department-wide T&E funding and infrastructure (labs, ranges, tools) requirements.
- **Policy and Guidance**
  - Update policy and guidance to ensure T&E is operationally representative, credible and efficient.

Independent and authoritative evaluation of warfighting in operationally representative conditions prior to fielding or prior to full-rate production.

Acronyms: DOT&E – Director, Operational Test and Evaluation; USC – United States Code; T&E – Test and Evaluation; SecDef – Secretary of Defense; DOD – Department of Defense; FY – Fiscal Year

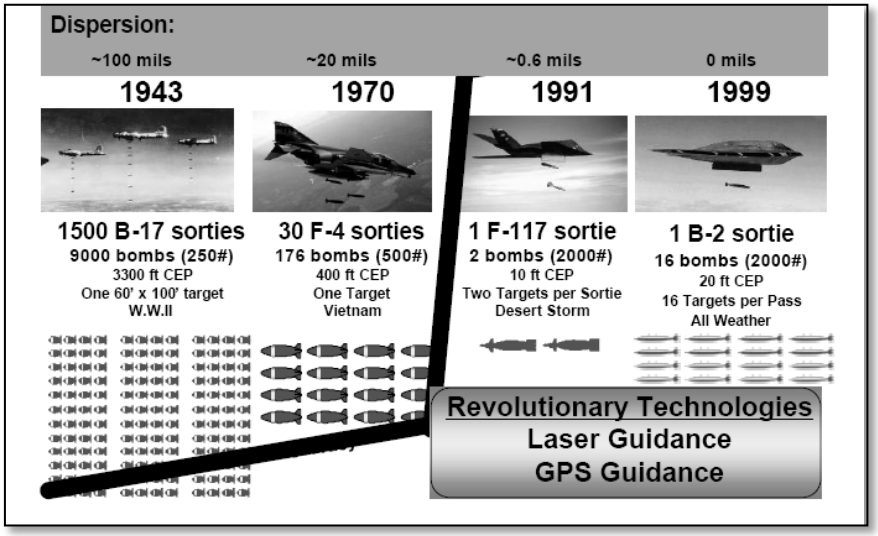
DOT&E is a Principal Staff Member reporting directly to the Secretary of Defense

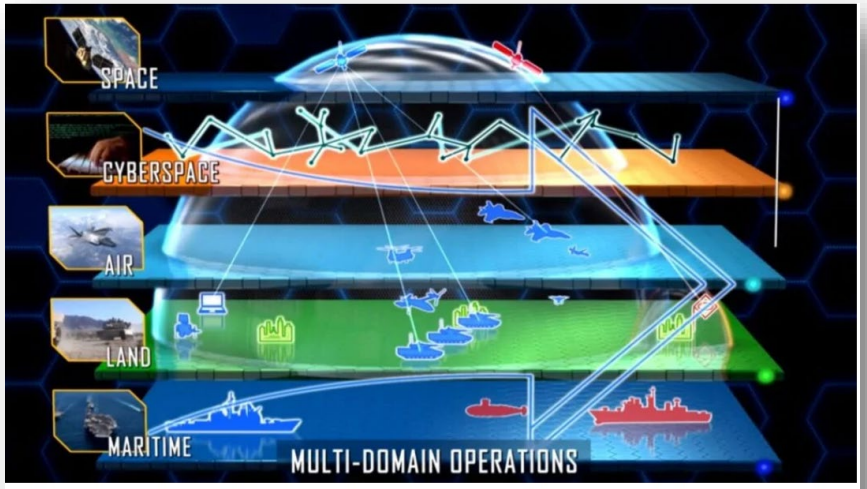
Direct Reports	
OSD	16
IG DoD **	1
Total	17



Acronyms in Slide: SES – Senior Executive Service; PAS – Presidentially Appointed, Senate-Confirmed: OSD - Office of the Secretary of Defense; USD – Under Secretary of Defense; DoD – Department of Defense; ASD – Assistant Secretary of Defense; ATSD – Assistant to the Secretary of Defense

Revolution of the Operational Environment

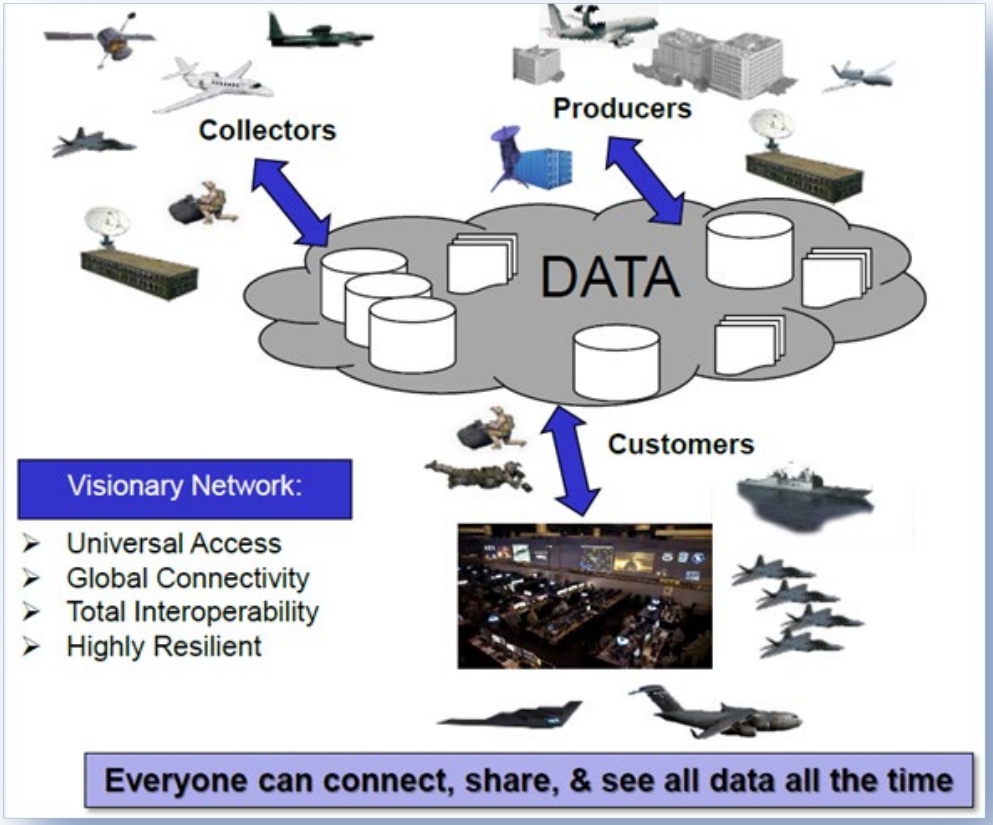




Multi-Domain Operations, or All Domain Operations, envisions a new collaboration across land, sea, air, space, and cyberspace (Army graphic)

Multi Domain Operational Environment…"a concept that tackles operational capability holistically, through the use of mission threads: sensor-to-shooter, situational awareness, joint targeting, joint kinetic and non-kinetic precision fires, maneuver, and sustainment."

Dominate in a Multi Domain Operational Environment



Deliver information advantage at the speed of relevance by ingesting, sensing, analyzing, predicting, deciding, acting, and securing data across the entire Joint Force, at every echelon, from the strategic level to the tactical edge.

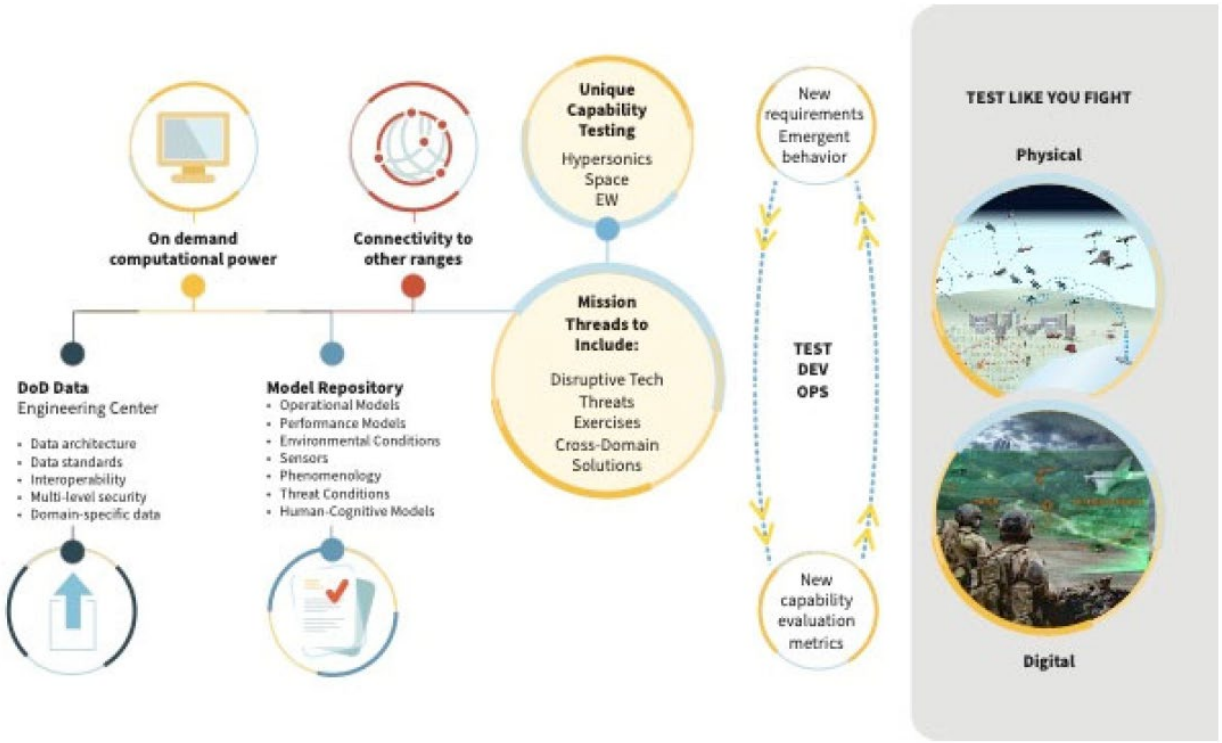
SIPET – new division intended to be forward looking – focused on coordinating and resolving current and emerging T&E challenges.

Forward Looking: Test Like You Fight

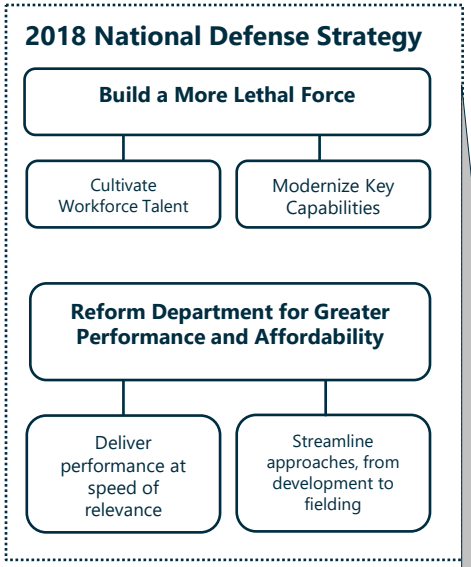
Testing system of systems in a multi-domain environment

Leveraging digital technologies to support T&E (to enable the use of AI-based systems and the development of adequate virtual operational environments)

The need for continuous testing given the fast pace at which weapons are evolving



Current and Emerging T&E Challenges



Software and Cybersecurity T&E

Goal: Increase understanding and confidence in the warfighting capability of software-intensive systems with emphasis on survivability against cyber threats.

Next-Generation T&E Capabilities

Goal: Leverage S&T advances to reduce T&E cost and time and ensure T&E is operationally representative, which will reduce forces' operational risk.

Integrated T&E Lifecycle

Goal: Improve approaches to integrating testing and data collection across the full system lifecycle.

Digital Transformation

Goal: Establish the strategic foundation needed to advance digital engineering in T&E, enabling streamlined, automated, model-centric T&E processes.

Workforce Expertise and Partnerships

Goal: Deepen and expand in-house scientific and technical expertise, and access to outside technical talent, to ensure a workforce that is capable of testing and evaluating complex current and future systems.

Acronyms in slide: DOT&E – Director, Operational Test and Evaluation; S&T Science and Technology; T&E – Test and Evaluation;

Software and Cybersecurity T&E

The attack surface is expanding at an exponential rate:

- Networks using other than IP-protocols.
- Commercial cloud environments and cloud services.
- AI and Big Data applications.
- Defense industrial base, supply chain, and development environments.

Our capabilities must improve at similar rates:

Automated methods, tools to assess and estimate effects.

Testing continuity through lifecycle T&E data storage infrastructure and standards

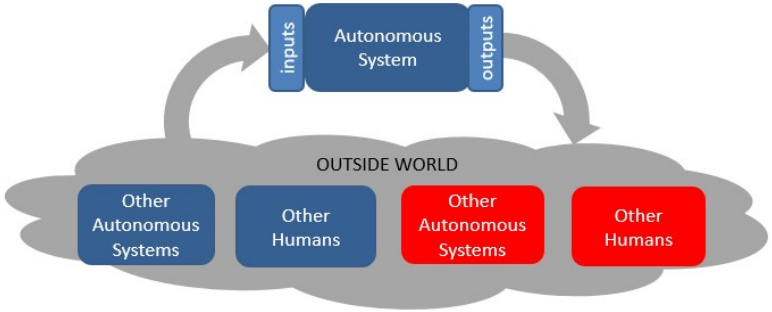
Improvements in contracting language to appropriately interact with commercial entities.

Next Generation T&E Capabilities

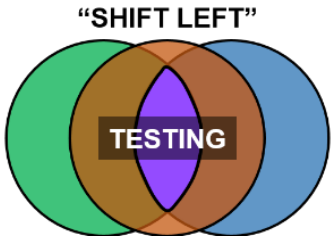
Software-intensive, data-centric, AI/ML-enabled systems

T&E of systems that will learn over time, develop “emergent” behaviors across systems, and team with human operators requires:

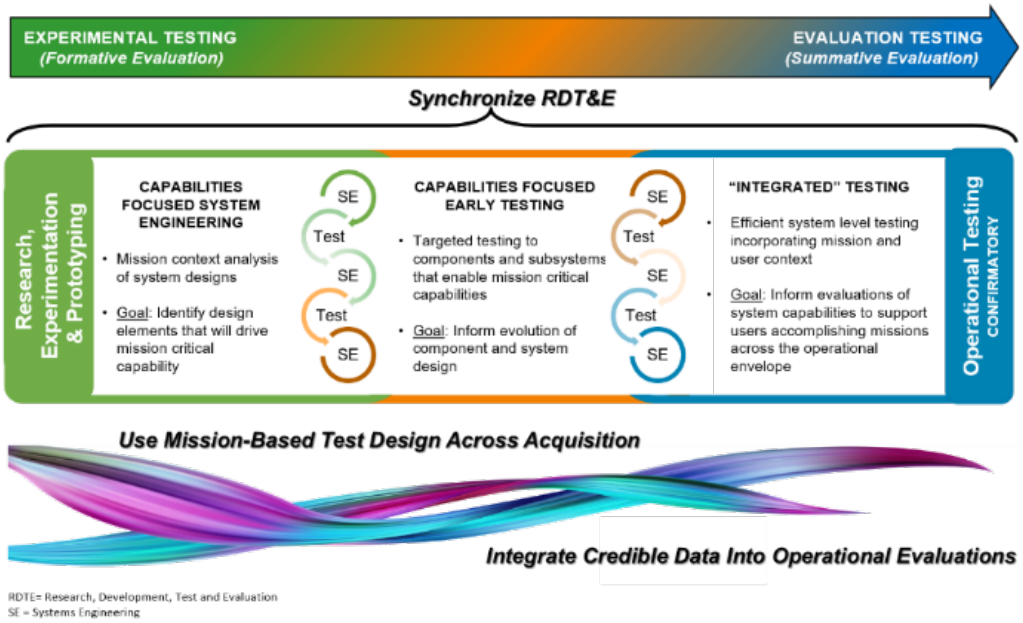
- “Virtual ranges” with hardware/software-in-the-loop to support high-fidelity/density operational scenarios and cognitive instrumentation to support detailed behavioral tracking and playback.
- Full lifecycle data management, with data curation for learning systems to prevent “data poisoning”, minimize the impact of counter-AI/autonomy attacks, and ensure response across all operational scenarios.
- M&S tools, test automation and data analytics to deal with complex/stochastic behaviors and AI/autonomy-specific vulnerabilities.



Integrated T&E

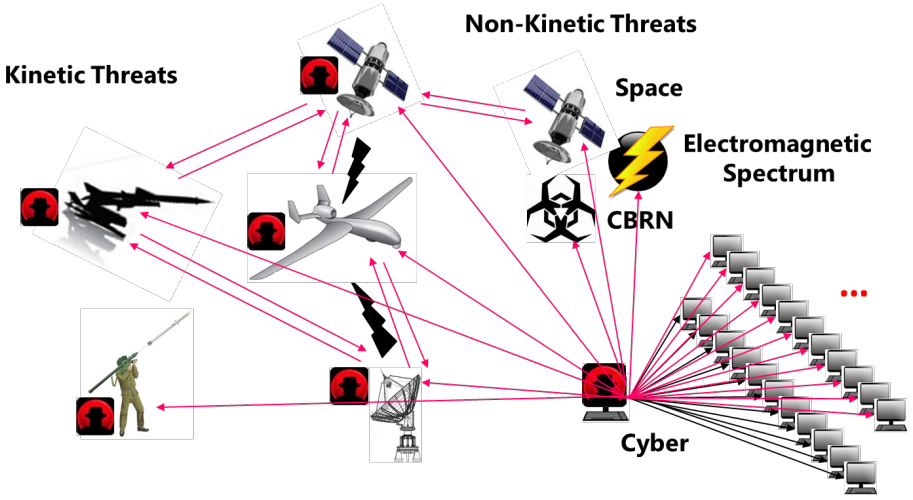


- A holistic evaluation framework is required to support complex MDO command and control, fires and effects
- Obtain more mission-relevant and targeted information earlier in the program.
- Leverage model based and mission based T&E and sequential T&E methods across the lifecycle of the program



All testing seen on a continuum, where testing is sequentially updated and refined based on previous test outcomes.

Digital Transformation



- Extensive digital systems, more network-connected than ever before and facing new and different types of threat.
- Not all systems can be tested live requiring enterprise-level digital capabilities for assessing performance that catches combined effects and interactions
- Focus must be on the larger System-of-Systems and the technologies that enable them.

Digital engineering approach takes advantage of different tools for quick development and integration of multiple systems and manages the complication introduced by the exploding number of test cases required to establish system trust and performance confidence

Workforce Expertise and Partnerships

Lack of manpower agility and expertise to perform increasingly complex T&E at the necessary scale, frequency, and depth. Must:

- Develop and execute a training curriculum in specific technical areas with periodic refresh to support T&E needs.
- Build partnerships with and create reach-back mechanisms to access SMEs within key universities, research organizations, and industry to fill knowledge gaps for identified technical areas.
- Cultivate and maintain partnerships with key federal and international partners to share lessons learned, ensure operational assessments fulfill requirements, and leverage mutual areas of interest in T&E investments.

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SIPET intends to tackle enterprise level challenges and needs support from stakeholders in academia to expedite implementation of DOT&E strategic initiatives

QUESTIONS AND DISCUSSION

SYSTEMS ENGINEERING RESEARCH CENTER

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